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A NEW METHOD OF COCA PREPARATION IN THE COLOMBIAN AMAZON

BY

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COCA, the well-known narcotic elaborated from the leaves of *Erythroxylon Coca* Lam., is used over a wide area in the Andean highlands of southern Colombia, Ecuador, Peru and Bolivia, in parts of the western Amazonia and in certain isolated regions such as the Sierra Nevada de Santa Marta in northernmost Colombia. The manner of using coca differs appreciably in each of these areas, and, even within a given area, coca-chewing often varies somewhat from locality to locality.

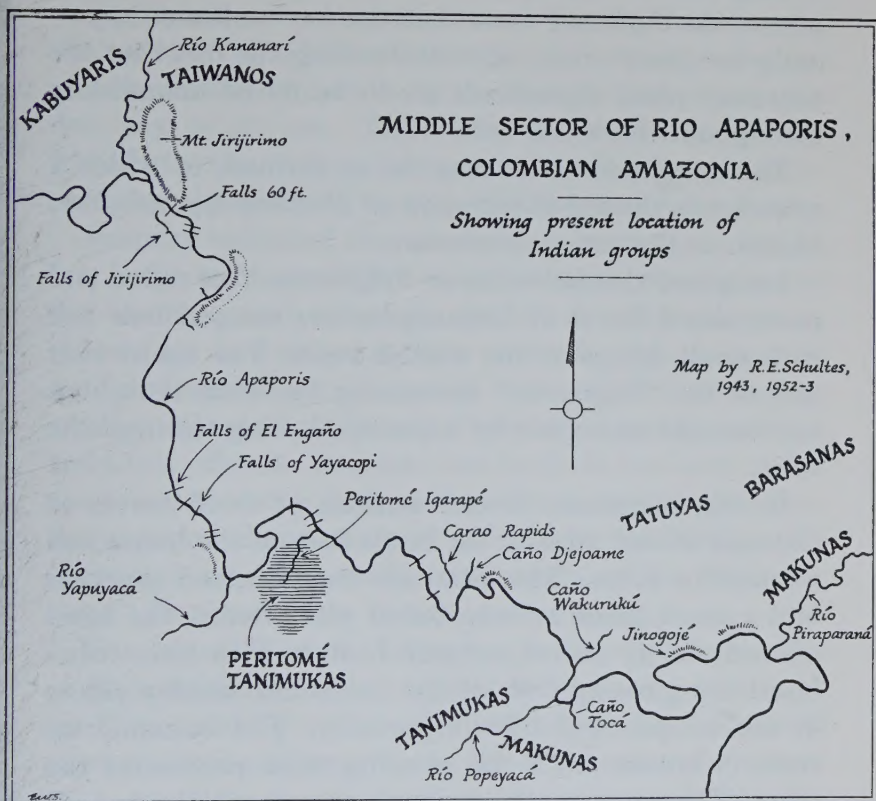
Curiously, the preparation and use of coca in the Amazonian parts of Colombia vary very little, if at all, from tribe to tribe. Quite in contrast to the method of use common throughout the Andean highlands, where dried, whole leaves of the plant are chewed with alkali quids of diverse origins, the method throughout the forested northwest Amazon requires the toasting and pulverization of the leaves. Into the resulting fine, green powder is thoroughly mixed as an alkaline component the finely sifted ashes of the leaves of any of several species of *Cecropia* or of *Pourouma*, usually *P. cecropiaefolia* Mart. The final powder is pale greenish, often with a slight greyish hue, and, when fresh, has a flavor which is not at all unpleasant.

The Indians of the Colombian Amazon take this dry powder into the mouth and, with the tongue, slowly work the gradually moistening mass until it is packed between the cheek and the gums. The slow "dissolving" and swallowing of the coca-ash mixture induces the desired narcotic effects and, in many ways, is much pleasanter and more satisfactory than the highland method of chewing harsh, dried leaves with lime pebbles or other alkaline agents.

For many years, I had studied the preparation and use of coca in eastern Colombia and had experimented with it myself over long periods. The similarity of its preparation over such a wide area was rather monotonous. In March 1952, however, I encountered the only major difference in coca-making which ever came to my attention during my more than a decade of travel through the region. It was as unexpected as it was novel. Even Koch-Grünberg, whose ethnological work in the region is classic, fails to report this method of coca preparation (Koch-Grünberg, Theodor: "Zwei Jahre unter den Indianern" 1 (1909); 2 (1910). Neither does the most recent and most thorough study of coca in Colombia (Uscategui Mendoza, Nestor: "Contribución al estudio de la masticación de las hojas de coca" in *Rev. Col. Anthropol.* 3 (1954) 209-289) consider it. Since it seems not to have been reported, it will be described in detail as a contribution to our growing understanding of the narcotics of South America.

In the very headwaters of the Igarapé Peritomé, a small creek on the right bank of the Río Apaporis into which it empties slightly downstream from the great falls known as the Cachivera de Yayacopi or Raudal de La Playa, there is a small group of Tanimuka Indians living entirely detached from the main body of the tribe on the Río Popeyacá to the east (See map). This group,

numbering now only twenty-five or thirty, apparently fled to hiding in this remote spot more than a quarter of a century ago rather than submit to enforced labor in the balata-forests.



It would seem that these isolated Tanimukas hold a monopoly on this unusual method of coca-making. Whether it is a recent innovation of their own or whether it represents a once more widespread culture-trait surviving only in this small band we cannot declare. All that I can state with certainty is that the custom is not practiced amongst any of the other coca-using tribes of Amazonian Colombia, not even in the main group of Tanimukas. It is worthy of note, nevertheless, that the

Tanimukas of the Popeyacá, as well as Yukunas, Makunas and other neighboring peoples, occasionally journey to the Peritomé Tanimukas, especially immediately prior to important dances or festivals, to purchase large supplies of the Peritomé coca. And this has continued apparently for many years, notwithstanding the fact that the necessary plant ingredients are to be found abundantly throughout the whole area.

The refinement, if it may be so termed, to which I refer lies in the use of the resin of *Protium heptaphyllum* March. in the coca-ash mixture.

Long and slender tubes or "cigarettes" of rolled and partly dried leaves of *Ischnosiphon* are tamped half full with small lumps of the whitish resin. The tip of that part of the "cigarette" containing the resin is lighted and brought to a glow by a gentle blowing through the tube.

In the meantime, several armfuls of dried leaves of *Cecropia* are set afire on the earth floor of the house and reduced to ashes. The ashes are then scraped together into a small, more or less conical pile. Before the ashes are completely cooled, several Indians with resin-tubes insert the glowing ends of the tubes into sundry places in the ash-pile and blow vigorously. The balsamic incense or smoke from the glowing resin permeates the ashes. This process, which fills the house with a pleasant myrrh-like aroma, continues for seven or eight minutes or until most of the resin in the tubes is spent.

The ashes are then collected, sifted through a piece of fine, pounded bark-cloth and added to an equal amount of pulverized and sifted coca powder. The product is then ready for use.

The presence of the incense from *Protium*-resin alters appreciably the usual characteristic taste of coca, giving it a balsamic savor. There is no evidence, however, that

this addition either heightens or lessens the normal narcotic effects of coca prepared in the manner customary throughout the northwest Amazon. It would seem to be obvious that the only effect sought is a change in taste.

Thoroughly accustomed though I was to the use of coca at this time, I found that the resin-treated product usually caused irritation of the mouth and throat the first day of its use. This irritation, due undoubtedly wholly to the balsamic smoke absorbed by the ash-particles, disappeared upon continued use of the coca.

Enquiry indicated that the resin of *Protium heptaphyllum* is the only one of the many balsamic exudations of the forests considered to be suitable for flavoring coca. According to Indian custom, resin for this purpose is gathered exclusively from old trees of *Protium heptaphyllum*, but no "explanation" for avoidance of younger trees was offered. Incisions are made in the bark of the trees, and the resin is allowed to dry on the trunk before being gathered and wrapped up in leaves into little packets which are hung under the rafters of the house to "age" for four or five months before using.

The genus *Protium*, belonging to the Myrrh Family or Burseraceae, has given several resins to commerce and medicine, and the resins of allied genera have likewise enjoyed economic importance. Several species of *Protium* from northern South America have been of value as medicinal plants, but they are no longer so employed in the United States.

The resin from *Protium heptaphyllum*, a species widespread in South America, is usually referred to in Colombia as *brea* or *pergamín*, but it is known commercially as *tacamahaca* gum. These vernacular names, however, may also be applied to the resins of other burseraceous plants. This species yields a hard, translucent, white resin which easily fractures and which is distinctly pungent

even when old and dried. The properties of *tacamahaca* are similar to those of other terebinthinates. Its most important use at the present time is as an incense in churches. Some is exported to the United States from Brazil for use in the lacquer industry (Tschirch, A. and E. Stock: *Die Harze* 2, pt. 1 (1935) 339). While the fragrance of *brea* is exceedingly strong, the report that "where this tree grows, the air in the vicinity seems pleasant and wholesome from the incense-like resin that drops from any wound in the bark and collects in masses on the ground" (Record, S. J. and R. W. Hess: *Timbers of the New World* (1943) 109) would seem, at least insofar as my own field experience has taught me, to be rather an exaggeration.

Chemically, the resin of *Protium heptaphyllum* is made up of 30 per cent protamyrine, 25 per cent protelemenic acid, 37.5 per cent proteleresin as well as several minor constituents such as oil (Wehmer, C. : *Die Pflanzenstoffe*, ed. 2, 2 (1931) 651).

Caraña, known also as *gum caranna* or *Brazilian elemi*, is the product of a closely allied species, *Protium Carana* March. It has a balsamic odor only when fresh, and it is bitter to the taste. The dried resin is usually grey or blackish grey and translucent, and it fractures with a very lustrous break. It apparently is not employed in the preparation of coca. Its other uses are, in general, similar to those of the resin from *Protium heptaphyllum* and often-times the two are not distinguished by native peoples.

THE GENUS *QUARARIBEA* IN MEXICO AND THE USE OF ITS FLOWERS AS A SPICE FOR CHOCOLATE

BY
RICHARD EVANS SCHULTES

I. TAXONOMIC NOTES ON *QUARARIBEA*

THE taxonomic history of *Quararibea* is complex. The genus has been united with *Matisia*, with *Myrodia*, with both *Matisia* and *Myrodia*, and kept distinct by the numerous botanists who have treated the group.

De Candolle (Prodr. 1 (1824) 477) joined *Quararibea* and *Myrodia* but kept them separate from *Matisia*. Endlicher (Gen. Pl. (1836-40) 992) followed the same disposition of these genera.

Baillon (Hist. Pl. 4 (1873) 155) reduced *Matisia*, *Matisiopsis*, *Myrodia*, *Lexarsa*, *Gerberia* and *Myrodiopsis* to synonymy under *Quararibea*.

K. Schumann's treatment (in Natürl. Pflanzenfam. 3, 6 (1895) 64) united *Myrodia* with *Quararibea* and excluded *Matisia*. Basing his work on that of Baillon (in Adansonia 10 (1873) 146), he differed from Baillon only in the exclusion of *Matisia*. He divided *Quararibea* into two sections on the basis of the disposition of the anthers:

Section I: *Euquararibea* Baillon — Anthers disposed in a circle on the apical part of the staminal column or on the upper quarter of the column.

Section II: *Myrodia* (Swartz) Baillon — Anthers disposed only at the apex of the staminal column.

Vischer (in Bull. Soc. Bot. Genève, ser. 2, 11 (1919) 199) followed Baillon in uniting *Matisia* and *Myrodia* under *Quararibea*, including *Matisia* as a subgenus of *Quararibea*.

He offered an apparently far more fundamental subgeneric classification of *Quararibea*¹ than that proposed by Schumann. It was based on the structure of the ovary and the appearance of the staminal column.

Subgenus I : *Archiquararibea* Vischer—Ovary 2-locular; staminal column obsoletely 5-dentate or shortly 5-fid.

Subgenus II: *Lexarza* (Llave) Vischer emend. —Ovary 4-locular; staminal column apically dilated, 5-dentate.

Subgenus III: *Matisia* (Humboldt & Bonpland) Vischer—Ovary 5-locular; staminal column profoundly 5-fid.

In 1948, Cuatrecasas (in *Lloydia* 11 (1948) 185) considered *Matisia* as a synonym of *Quararibea*. Six years later, however, he (in Rev. Acad. Col. Cienc. 9 (1954) 175) outlined the results of more intensive study of these groups and concluded that *Matisia* and *Quararibea* should be maintained as distinct concepts.

García-Barriga (in *Mutisia* 2 (1952) 1) indicated that he accepted *Quararibea* and *Matisia* as the same and made several nomenclatural transfers from *Matisia* to *Quararibea*.

For reasons which I consider in detail below, I believe that *Matisia* should be retained as a distinct generic concept, even though not all of the plants which are or have been referred to *Matisia* may belong to it. Since I am excluding *Matisia*, I have not included a bibliographic history of it in this paper.

¹Two of the three Mexican species of *Quararibea* (*Q. verticillaris* (DC.) Vischer and *Q. Fieldii* Millspaugh), fall into the subgenus *Archiquararibea*, and one (*Q. funebris* (Llave) Vischer), falls into the subgenus *Lexarza*. Indeed, the latter subgenus consists only of this one species.

The genus *Quararibea* (exclusive of *Matisia*) includes about twenty-nine species. These species show a wide range of variation with all conceivable intergrades. The differences which are exhibited, moreover, are so extensive that Bentham and Hooker included *Myrodia* (now considered to represent *Quararibea*) in the *Sterculiaceae* and *Quararibea* in the *Malvaceae* (inclusive of the *Bombacaceae*).

Quararibea is a widespread genus of tropical American trees and shrubs, occurring in Middle America, the West Indies and the northern part of South America. It is at once characterized by a peculiarly pungent, aromatic odor suggestive of slippery elm (*Ulmus rubra* Muhl.). This odor is present in every species and may be valuable in generic identification.¹ Most botanists who have considered *Quararibea* have remarked about its pungent fragrance. Endlicher (*loc. cit.*), for example, stated that the genus consists of "arbores v. frutices Americanae tropicae, odore aromatico gravi, tenaci"

The fragrance is strongest and most noticeable in the flowers, but it is also characteristic of the fruit. Other parts of the plant, as well, are reported to contain the aromatic principle. Standley (in *Field Mus. Nat. Hist.* 3, pt. 3 (1930) 354) called attention to the fact that the foliage of a Yucatan species has the "odor of slippery elm." In an article on the woods of the American bombacaceous plants, Record (in *Trop. Woods* 59 (1939) 19) made the statement that in *Quararibea* "The leaves and bark, at least in certain species, have a peculiar odor variously described as resembling curry powder, fenugreek (*Trigonella foenumgraecum* L.), inner bark of Slippery Elm (*Ulmus fulva* Michx.), or licorice." In addition to the flowers, fruit, foliage, and bark, the wood also has been reported sometimes to possess the pungent

¹ The name *Myrodia* is from the Greek, meaning "scent of myrrh."

fragrance. Of the wood, Record (*loc. cit.*) reported: "Tasteless and generally odorless, sometimes with characteristic scent of the bark and leaves."

The odor of *Quararibea* is extremely persistent. I have had an opportunity to examine several specimens which were collected in Mexico by Liebmann in 1841—more than a century ago. The fragrance from these specimens is but slightly weaker than that from herbarium material collected in the past twenty years.

Matisia is very closely related to *Quararibea*. Vegetatively, the two genera have many points of resemblance, although there are rather sharply distinguishing differences. The fact that the ovary is rather consistently 5-locular, however, would seem to indicate a fundamental difference between *Matisia* and the 2- or 4-locular *Quararibea*. Furthermore, another conspicuous difference is the entire lack in *Matisia* of the characteristic odor of *Quararibea*. This is true of all of the herbarium specimens of *Matisia* which I have had occasion to examine. It has been stated that all of the members of the genus lack it. Although Baillon did not consider the odor to be a character of significance, he made mention of the absence of it from his section *Matisia* of the genus *Quararibea*. He wrote (*loc. cit.* 147): "Je ne parle pas . . . de l'odeur de Mélitot, mais qui n'a pas, paraît-il, été constatée dans les *Matisia*, mais qui pourrait être plus ou moins fugitive ou qui ne serait pas, en tout cas, un caractère d'une importance absolue." Similarly, Triana and Planchon (in *Ann. Sci. Nat. ser. 4*, 17 (1862) 324), in discussing the fragrance of dried specimens of *Myrodia Cacao* Triana & Planchon, stated that "c'est l'ordinaire pour ce genre, une odeur très prononcée de Mèlitot, laquelle manque absolument a tous nos *Matisia*."

Record (*loc. cit.* 15) points out that there are differences of a minor nature between the woods of *Matisia*

and *Quararibea*. These, however, are not of a fundamental character, and he names three species, now referred to *Matisia*, which are inseparable from *Quararibea* on the basis of wood structure alone. Record and Hess (Timbers of the New World (1943) 96) have maintained the two genera as distinct.

In consideration of the differences in structure of the ovary, of the absence of the characteristic odor of *Quararibea*, and of the presence of minor and variable vegetative differences, I believe that *Matisia* is best maintained as a distinct genus.

Quararibea Aublet Pl. Guian. 2 (1775) 691—Scopoli Introduct. (1777) n. 1297—Aublet in Cavanilles, Diss. 3 (1785–1790) 175, t. 71, fig. 2—Poiret in Lamarck, Encycl. 6 (1804) 22; *ibid.*, Suppl. 4 (1816) 636—De Candolle Prodr. 1 (1824) 477—Bentham & Hooker Gen. Pl. 1 (1867) 212—Baillon Hist. Pl. 4 (1873) 155—Baillon in Adansonia 10 (1873) 146—K. Schumann in Martius Fl. Brasil 12, 3 (1886–1892) 240—K. Schumann in Natürl. Pflanzenfam. 3, 6 (1895) 64–65—Standley in Contrib. U.S. Nat. Herb. 23, 3 (1923) 787—Britton & Wilson Sci. Surv. Porto Rico & Virgin Islands, 5, 4 (1924) 569—Standley in Contrib. U.S. Nat. Herb. 27 (1928) 260—Standley in Field Mus. Nat. Hist. Bot. Ser. 3, 3 (1930) 354—Standley in Field Mus. Nat. Hist. Bot. Ser. 10 (1931) 278—Standley in Field Mus. Nat. Hist. Bot. Ser. 12 (1936) 251—Williams in Field Mus. Nat. Hist. Bot. Ser. 15 (1936) 316—Standley in Field Mus. Nat. Hist. Bot. Ser. 18, 2 (1937) 683. TYPE SPECIES: *Quararibea guianensis* Aublet.

Lexarza Llave in Llave & Lexarza Nov. Veg. Descr. 2 (1825) 7. TYPE SPECIES: *Lexarza funebris* Llave.
Myrodia Swartz Prodr. (1788) 102—Schreber in Linnaeus Gen. Pl. (1789) 472—Swartz Fl. Ind. Occ.

(1800) 1225)—De Candolle Prodr. 1 (1824) 477—St. Hilaire Fl. Brasil mer. 1 (1824) 208, t. 53—Endlicher Gen. Pl. (1836–1840) 991–992—Grisebach Fl. British West Indies (1864) 88—Hemsley Biol. Centr.-Am. Bot. 1 (1879–1888) 127—Bentham in Journ. Proc. Linn. Soc. Bot. 6 (1862) 115—Triana & Planchon in Ann. Sci. Nat., s. 4, 17 (1862) 324–328—Bentham & Hooker fil. Gen. Pl. 1 (1867) 219—Pittier Prim. Fl. Costaric. 2, 1 (1898) 49—Conzatti Gen. veg. mex. (1903) 128. TYPE SPECIES: *Myrodia turbinata* Swartz.

Quararibea funebris (Llave) Vischer in Bull. Soc. Bot. Genève, s. 2, 11 (1919) 295—Standley in Contrib. U.S. Nat. Herb. 23, 3 (1923) 787—Bakhuizen van den Brink in Bull. Jard. Bot. Buitenzorg, s. 3, 6, 2 (1924) 209—Standley & Calderón List. Pl. El Salvador (1925) 148—Standley in Field Mus. Nat. Hist. Bot. Ser. 12 (1936) 251—Standley in Field Mus. Nat. Hist. Bot. Ser. 18, 2 (1927) 683.

TYPE: Collected at Izucar, Puebla, under the direction of Guadalupe Victoria, President of Mexico. Apparently not extant.

Lexarza funebris Llave ex Llave & Lexarza Nov. Veg. Descr., 2 (1825) 7—León in Ximénez Cuatr. Libr. Nat. (1888) xlix.

Myrodia funebris (Llave) Bentham in Journ. Proc. Linn. Soc. Bot. 6 (1862) 115—Hemsley Biol. Centr.-Am. Bot. 1 (1879–1888) 127—Pittier Prim. Fl. Costaric. 2, 1 (1898) 49—Ramírez & Alcocer Sin. vulg. cient. pl. mex. (1902) 11, 107—León in Sahagún Hist. cos. Nueva España 3 (1938) 348.

SPECIMENS EXAMINED:¹

Specimens referable to Quararibea funebris:

L. H. Bailey 555, March 19, 1940, Oaxaca (flowers purchased in market in Oaxaca City) (EH); Conzatti 16, December 7, 1895, Vera

Cruz (G); *Conzatti s.n.*, March 1940, Oaxaca (EH); *Karwinski s.n.* (photograph of the specimen in Berlin), Oaxaca (G)²; *Liebmann 429*, Oaxaca (?) June 1841 (F, US); *Llave s.n.* (photograph of the specimen in Geneva) Mexico (possibly Oaxaca) (F, EH, S); *C. D. Mill (?) s.n.*, "Cazones, Mexico," October 20, 1923 (NY); *Popenoe 744*, November 28, 1916, Guatemala (US); *Schultes 843*, June 1939, Oaxaca (150 flowers purchased in market in Oaxaca City) (EH); *Schultes & Reko 493*, August 1938, Oaxaca (50 flowers purchased in Oaxaca City) (EH); *Skutch 1846*, December 5, 1935, Guatemala (US).

Sterile specimens probably or possibly referable to Quararibea funebris:

Cook & Griggs 489, April 7, 1902, Guatemala (U.S.); *Williams 8928*, February–March 1937, Vera Cruz (F).

Specimens filed hitherto in herbaria as (but now excluded from) Quararibea funebris:

Brenes 19247, July 21, 1934, Costa Rica (F); *Heyder 2*, 1927, British Honduras (U.S.); *Record & Kuylen H66*, February 16, 1927, Honduras (NY, US); *Renson 318*, El Salvador (US); *Schipp 407*, October 15, 1929, British Honduras (A, F, G, M, NY, US); *Standley & Valerio 46611*, January 10–31, 1926, Costa Rica (US); *Williams 8500*, March 1937, Vera Cruz (F, M); *Williams 8317*, March 1937, Vera Cruz (F, US).

SPECIMENS NOT EXAMINED BUT CITED IN THE LITERATURE:

Andrieux 512, Oaxaca (B, K); *Hayes s.n.*, San Salvador (K); *Liebmann s.n.*, Vera Cruz (K).

¹ Abbreviations used for herbaria represent:

A Arnold Arboretum, Harvard University

B British Museum (Natural History)

EH Economic Herbarium of Oakes Ames, Harvard University

F Field Museum of Natural History

G Gray Herbarium, Harvard University

K Royal Botanic Gardens, Kew

M Missouri Botanical Garden

N New York Botanical Garden

US United States National Herbarium, Smithsonian Institution

² Photographs of this Karwinski collection have erroneously been designated in American herbaria as representing the type of *Myrodia verticillaris* [Moçño & Sessé] ex de Candolle. It is not a type specimen. Furthermore, it is referable to *Quararibea funebris*.

VERNACULAR NAMES:

cacahuaxochitl; *cacaoxochitl*; *cacauaxochitl*; *canela*; *flor de cacao*; *madre de cacao*; *rosa de cacao*; *rosita de cacao*; *tepecacao*.

Quararibea funebris occurs in Mexico (Puebla, Vera Cruz and Oaxaca) and Guatemala. Its range has erroneously been stated to include British Honduras, Honduras, Costa Rica and El Salvador. This extension of range is attributable to the misidentification of specimens from these countries. Many of the specimens which have been referred to *Quararibea funebris* are sterile; those which are fertile are often only in fruit. Fortunately, however, it is not difficult to ascertain whether or not a fruiting specimen represents *Quararibea funebris*, for this species is the only reputedly 4-locular member of the genus, the others having two locules. The following collections: *Brenes 19247* (Costa Rica), *Heyder 2* (British Honduras), *Record & Kuylen H66* (Honduras), *Renon 318* (El Salvador), *Schipp 407* (British Honduras), and *Standley & Valerio 46611* (Costa Rica) have been responsible for the erroneous extension of the range of *Quararibea funebris* southeast of Guatemala. None of these collections can be referred to *Quararibea funebris*. Hemsley (Biol. Centr.-Am. 1 (1879-1888) 127) has cited a collection (*Hayes s.n.*) from San Salvador as representing *Quararibea funebris*, but it would appear to represent another species. The species concepts of *Quararibea* have been poorly understood and very loosely applied, even in very recent work.

Bakhuisen van den Brink (*loc. cit.* 209) states that *Quararibea funebris* grows also in Brazil, but he cites no specimens with which to authenticate such an extraordinary occurrence. This extension of range is open to very serious doubt.

The type of *Quararibea funebris* is probably not extant. Many of the Llave plants have been lost or de-

stroyed, but a Llave collection of *Quararibea funebris* in the herbarium at Geneva has passed as the type. It is labelled in Llave's handwriting, but the word "typus" has been added in another hand. Although Vischer apparently considered this to be the type, it probably does not represent the collection from which *Lexarza funebris* was described, because Llave explicitly stated that the branch which was sent to him for description bore flowers and fruits; the Llave collection in Geneva is sterile and has no indications of ever having borne flowers or fruits.

Quararibea Fieldii *Millspaugh* in Field Col. Mus. Bot. 1, 1 (1897) 309—Millspaugh in Field Col. Mus. Bot. 1, 1 (1898) 379—Vischer in Bull. Soc. Bot. Genève, s. 2, 11 (1919) 210—Standley in Contrib. U.S. Nat. Herb. 23, 3 (1923) 788—Bakhuizen van den Brink in Bull. Jard. Bot. Buitenzorg, s. 3, 6, 2 (1924) 210—Standley in Field Mus. Nat. Hist. Bot. Ser. 3, 3 (1930) 354—Standley in Field Mus. Nat. Hist. Bot. Ser. 12 (1936) 251.

SPECIMENS EXAMINED:

Specimens referable to Quararibea Fieldii:

Gaumer 879, August 1895, Yucatan (F—TYPE), (F, G, NY, US—ISOTYPES); *Lundell* 6507, June–August 1936, British Honduras (M, US); *F. Morton* 359, December 21, 1928, Guatemala (F); *Schott* 18, November 18, 1864, Yucatan (F); *Schott* 18a, November 18, 1864, Yucatan (F); *Standley* 54638, December 6, 1927–March 20, 1928, Honduras (US); *Steere* 1472, June 22, 1932, Yucatan (F, M); *Stevenson & Smart* s.n., December 1930, British Honduras (M); *Stevenson & Smart* 146, December 9, 1930, British Honduras (F); *Stolf* 59, British Honduras (F).

Sterile specimens probably or possibly referable to Quararibea Fieldii:

Bartlett 12220, March 21, 1931, Guatemala (F, M, NY, US); *Gaumer* 23987, 1917–1921, Yucatan (F, US); *Gentle* 1716, August 20, 1935, British Honduras (F, M); *Lundell* 45, October 1928, British Honduras (F, M); *Record & Kuylen* H66, February 16, 1927, Honduras (NY, US); *Steere* 1605, June 28, 1932, Yucatan (M); *Williams* 8317

March 1937, Vera Cruz (F, US); *Williams 8500*, March 1937, Vera Cruz (F, M, US).

Specimens filed hitherto in herbaria as (but now excluded from) Quararibea Fieldii:

Standley 53137, December 6, 1927–March 20, 1928, Honduras (A, F, US).

VERNACULAR NAMES:

batidos; canela; coco-mamá; madre de cacao; maha; majahas; xmahas.

Quararibea Fieldii Millspaugh, which is somewhat larger in all its parts than *Q. funebris*, is apparently endemic to Yucatan, British Honduras, and Honduras. Sterile specimens from Vera Cruz and Guatemala, however, are very suggestive of *Quararibea Fieldii*, and this species may extend to these western extremes.

Of the many specimens of *Quararibea Fieldii* which I have been able to examine, only one sterile collection has been excluded from the species. I refer to *Standley 53137* from Honduras, which is certainly not referable to *Quararibea Fieldii*. A field note states that this collection was made from a shrub, whereas *Quararibea Fieldii* is a tree. Furthermore, the leaves of the three specimens of *Standley 53137* which I have seen are extremely narrow, linear-lanceolate and highly lustrous above. The shape and texture of the leaves suggest no species of *Quararibea* with which I am familiar and may represent an undescribed, shrubby species. At least, it is certain that this collection can not be referred to the large, broadly-ovate, dull-leaved *Quararibea Fieldii*.

Quararibea verticillaris ([*Moçinho & Sessé*] *ex De Candolle*) *Vischer* in Bull. Soc. Bot. Genève, s. 2, 11 (1919) 204; *Bakhuisen van den Brink* in Bull. Jard. Bot. Buitenzorg, s. 3, 6, 2 (1924) 211.

TYPE: Apparently not extant. Represented by a drawing of a *Sessé & Moçinho* collection: *De Candolle*, Calqu. dess. fl. Mex. (1874) t. 99.

Myrodia verticillaris [Moçño & Sessé] ex De Candolle Prodr. 1 (1824) 477—G. Don, Gard. Dict. 1 (1831) 508—Dietrich, Syn. Pl. 4 (1847) 807.

Although this species has not been collected subsequently in Mexico, and although its provenience in Mexico is unknown, it is nevertheless obviously distinct from *Quararibea funebris* and from *Q. Fieldii*. The drawing which serves as a type indicates clearly several diagnostic points of distinction, but without material for comparison and study it is difficult to determine the exact relationship of this species to the others of Central America. Vischer (*loc. cit.* 204) places *Quararibea verticillaris* in the subgenus *Archiquararibea*, indicating his belief that it is more closely allied to *Q. Fieldii* than to *Q. funebris*.

Quararibea turbinata (Swartz) Poiret in Lamarck Encycl. Suppl. 4 (1816) 636.

De Candolle reported this species from Mexico as *Myrodia ovata* Moçño & Sessé in synonymy under *Myrodia turbinata* Swartz. I have been unable to find a collection from Mexico which could be referred to this West Indian species. It is possible that the specimens upon which de Candolle based his report were erroneously identified, for specific distinctions in *Quararibea* have long been confused. Bakhuisen van den Brink (*loc. cit.* 15) has repeated this reported occurrence of *Quararibea turbinata* in Mexico, basing his statement probably on de Candolle's earlier report.

It is doubtful, in my opinion, that *Quararibea turbinata* occurs in Mexico. Therefore, I have not included a complete bibliographic summary of this species.

II. THE USE OF QUARARIBEA FLOWERS AS A SPICE FOR CHOCOLATE

In Mexico, the dried flowers of *Quararibea funebris*

and *Q. Fieldii* are used as spices for chocolate drinks, to which they impart a pungent, slightly peppery taste.

In the large native market in Oaxaca City, Oaxaca, a number of interesting local plants are offered for sale as medicines, charms, foods, and clothing materials. One of the most striking of these economic plants is *Quararibea funebris*.

The great central plaza of this market has three stalls where drugs are sold. In each of these drug-stalls, the herb-sellers or *herbolarios* offer scores of plant remedies for sale; each stall is plentifully supplied with dried flowers of *Quararibea funebris*. The Zapotecs of the Valley of Oaxaca use a decoction of these flowers as an aromatic cough remedy, but by far the greater part of the supply is utilized to flavor chocolate drinks.

Smaller village markets in the vicinity of Oaxaca City also sell the *flor de cacao*, but I have searched for it in vain in the important markets in Teotitlán del Camino in northeastern Oaxaca and in several markets in the State of Puebla. A small quantity of these flowers was found in an Indian shop in the remote Chinantec village of San Pedro Yolox in the District of Ixtlán, Oaxaca; here, however, the spice was obviously obtained in trade from the Valley of Oaxaca, for *Quararibea funebris* is a tree of the warm, dry desert, not of the cold, damp, forested mountains of the interior. Similarly, *Quararibea funebris* must be received in trade in the town of San Ildefonso Villa Alta in the District of Villa Alta, Oaxaca, where many of the inhabitants spoke to me of its use in chocolate drinks. Nevertheless, I was unable to find it in the prosperous market of this large Zapotec town.

The use of *Quararibea funebris* as a flavoring agent in chocolate drinks is not confined to the Indian population of Oaxaca. The *mestizos* and Spanish inhabitants also enjoy the combination of the aromatic flavor of the flow-

ers with rich chocolate. The flowers are added, ordinarily dried, during the preparation of the beverage, which in Oaxaca is usually some form of *pozonque*. *Pozonque* is made with finely ground corn meal and chocolate and is very nutritious. Occasionally, young shoots of a species of *Dioscorea* are added, and the beverage is beaten vigorously into a thick, albuminous froth. Fruits and other ingredients may sometimes be added.

As well as imparting to the beverage a peppery taste and aromatic odor, the flowers of *Quararibea funebris*, containing large quantities of mucilage, have a tendency to thicken the water in which the corn and cacao particles are suspended.

To his type description of *Quararibea funebris*, Llave¹ appended a long discussion of the habit, occurrence, and economic importance of the tree. A translation (by the writer) of this discussion follows. (Cf. Standley in Contrib. U.S. Nat. Herb. 23 (1926) 788).

While making a military expedition to the southern region between Oaxaca and Angelopolim, Guadalupe Victoria, the President of the Republic, passed through Izucar and admired the funereal majesty of *Lexarza*. He ordered a flowering and fruiting branch sent to me with the instructions that a description of it be made. Later, my beloved colleague, Doctor José Ignacio Luna, a worthy authority of Izucar, sent pictures of the tree and accurate measurements together with the information that the primitive natives were accustomed to come to mourn their dead under the magnificent shelter formed by the low branches of the tree. He stated also that the flowers were mixed with *pozonque* (a drink made from cold chocolate which is used at weddings and fiestas) in order to flavour it. For this reason, perhaps, the tree is popularly called *cacahuaxochitl*, which may be rendered into Spanish as *flor de cacao*. According to this same authority, no other tree of the same species is found in Izucar or in the general vicinity. Doctor Miguel Valentino of Huamantla, an authority on natural history and no mean observer, studied the description of *cacahuaxochitl* and assured me that on his trip through the Mixteca he saw trees of this species.

¹ Llave: in Llave & Lexarza Nov. Veg. Descr. 2 (1825) 8.

Ximénez (*Cuatro libros de la naturaleza y virtudes medicinales de las plantas y animales de la Nueva España* (1888) xlix, 184) described a flower which was known as the *flor de cacao*. León identified this as the flower of *Lexarza funebris* Llave (*Quararibea funebris*). A consideration of the brief description of the plant, however, indicates that this determination is incorrect. Described under the heading: *De la que llaman cacahuaxochitl o flor de cacao*, the plant to which he referred had cordate leaves, purple flowers, and a strong fragrance; furthermore, it was considered a remedy for intestinal bleeding; and it was hot and dry to the taste. Although Ximénez did not state that it was used to flavor chocolate, this use might possibly be inferred from the name, for a number of flowers, fruits, seeds, and leaves were and are used in Mexico for this purpose, and some of them have the same or similar names. *Quararibea* differs in several important respects from the *cacahuaxochitl* of Ximénez: it has ovate or elliptical (never cordate) leaves; and the flowers are pure white (never purple).

Sahagún (*Historia de las cosas de Nueva España* 3 (1938) 274) also described a plant which was called *cacauaxochitl*:

There are also other trees called *cacauaxochitl* which bear flowers which are called *cacauaxochitl*. They are like jasmine and have a very delicate but pungent fragrance.

Cacauaxochitl is illustrated in the Paso y Troncoso edition of Sahagún's *Historia de las cosas de Nueva España* (figure 684, lam. cxiv). The illustration, a copy of which is reproduced here, Plate LVIII, represents a tree which is abundantly flowering; two Indians are pictured beneath the tree, gathering the flowers in baskets. Although it is crudely drawn, this plate illustrates without any question the bombacaceous *Quararibea funebris* or *flor de cacao*.



QUARARIBEA FUNEBRIS (*Llave*) Vischer. *Cacavaxochilt* or *flor de cacao*, reproduced from the *Paso y Troncoso* edition of Bernardino de Sahagún: *Historia general de las cosas de Nueva España*.

References to the use of *Quararibea funebris* as a spice for chocolate amongst the Aztecs are apparently unavailable, although the Sahagún reference might seem indirectly to indicate that the flowers were put to this use. It is indeed singular that reports are lacking for the Aztec region, because the Aztecs, whose nobility is stated to have consumed much chocolate, imported many plants and plant products from southern tributaries. Furthermore, numerous references attest to the fact that the Aztecs were accustomed to flavor chocolate drinks with flowers, seeds, and other plant parts.

Quararibea Fieldii, like *Q. funebris*, is utilized as a spice for chocolate. It is a tree of the Mayan region and has been used by the Mayas from very early times.

In the *Diccionario de Motul* of the 16th Century (*Diccionario de Motul*, mss., 16th Century. Quoted in Roys: *Ethnobotany of the Maya*, Mid. Am. Research Ser. Publ. 2 (1931) 263), the use of *Quararibea Fieldii* flowers is mentioned. A translation of this early report follows:

Maha: a certain tree with odorous flowers which they throw into chocolate, and the flowers themselves.

The earliest modern report relative to the utilization of *Quararibea Fieldii* as a spice is to be found in the original description of the plant. Millspaugh stated that the "flowers are used to flavor chocolate" (Field Col. Mus. Bot. 1, i (1897) 309).

Other than these few botanical reports and the references from the *Diccionario de Motul*, I have been unable to find published indications concerning the extent of the use of the spice in the Mayan area. Lundell (in Pap. Michigan Acad. Sci., Arts Letters 24 (1939) 56), who has carried on botanical and ethnobotanical work in the Yucatan peninsula and adjacent regions, fails to mention the use of *Quararibea Fieldii* as a spice but notes its use

in other ways in his recent *Plants probably utilized by the Old Empire Maya of Petén and adjacent lowlands*.

It is interesting to note in passing that, because of the verticillate condition of the branching of species of *Quararibea*, the young shoots of these trees are used in many parts of Central America and the West Indies in the manufacture of the frothing-sticks or *molinillos* with which chocolate drinks are beaten. There are reports of this use of *Quararibea* from Mexico (in Contrib. U.S. Nat. Herb, 23, 3 (1926) 787-788), Costa Rica (*Plantas usuales de Costa Rica* (1908) 115), and other places in Middle America. Even in Puerto Rico and the Virgin Islands, *Quararibea turbinata* Poiret is known as the "swizzle-stick tree" (Britton & Wilson: Sci. Surv. Porto Rico & Virgin Islands, 5, 4 (1924) 569). Because of this extensive use, a number of the vernacular names of the trees refer to frothing-sticks: *molinillo*, *batidor*, etc. The name of one species is said (Record, *loc. cit.* 20) to be *cinco-dedos* ("five fingers"), likewise in reference to the interesting verticillate branching.

An examination of other vernacular names of *Quararibea* trees and their flowers should prove of interest. It is indeed significant that the common names are so inextricably associated with cacao. *Quararibea* does not resemble *Theobroma*, although the two genera belong to related families. Nor does *Theobroma* possess the characteristic odor of *Quararibea*. It seems probable, then, that the association has arisen either from the use of *Quararibea* flowers to spice chocolate drinks or from the widespread utilization of *Quararibea* twigs in the manufacture of frothing-sticks for making chocolate drinks.

A few examples will illustrate the extent of the association of *Quararibea* with *Theobroma*, as shown by the vernacular names. In Oaxaca, *Quararibea funebris* is called *cacaoxochitl* (Nahuatl: "cacao-flower"), *flor de*

cacao, *rosa de cacao*, *rosita de cacao*, and *tepecacao* ("wild cacao"). In the Maya area, *Quararibea Fieldii* is known as *coco-mamá* and *madre de cacao*. In Colombia, *Quararibea Cacao* (Triana & Planchon) Baillon is associated with *Theobroma Cacao* not only through its scientific name but also through its vernacular name—*cacao simarrón* ("wild cacao").

In Vera Cruz, according to field notes which accompany two Williams collections, a species of *Quararibea* is called *canela*. This is significant, because it represents the transfer of the Spanish name of the commercial cinnamon (*Cinnamomum zeylanicum* Nees) to *Quararibea*, and arises undoubtedly from the use of *Quararibea funebris* as a spice.